

Being a good external prefrontal lobe

Citation for published version (APA):

van de Werff, T. (2017). Being a good external prefrontal lobe: Parenting teenage brains. In J. Leefmann, & E. Hildt (Eds.), *The Human Sciences after the Decade of the Brain* Elsevier.

Document status and date:

Published: 01/01/2017

Document Version:

Accepted author manuscript (Peer reviewed / editorial board version)

Document license:

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Please use the following citation:

Van de Werff, T. (2017). Being a Good External Frontal Lobe: parenting teenage brains. In E. Hildt & J. Leefmann (eds.), *The Human Sciences after the Decade of the Brain* (pp. 214-230). London: Elsevier.

Being a Good External Frontal Lobe: parenting teenage brains

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Abstract

Knowledge on adolescent brain development is increasingly being used by pedagogues, family coaches and other parenting professionals to tell parents what to do with their teenage children. The promise is that knowledge of the teenage brain not only explains 'typical' adolescent behaviour, but also provides an answer to the timely question of how to be a good parent. This chapter explores how the popular notion of the teenage brain is made valuable in Dutch parenting discourse to address concerns and ideals of good parenting – in short, questions of ethics. Instead of providing an inconclusive answer, parenting experts mobilize the teenage brain to reconcile different and sometimes conflicting parental norms, resulting in two distinct moral repertoires of parenting as 'external frontal lobe'. The case of the teenage brain as parenting advice indicates the important role norms, values and ideas of the good play in the diffusion of neuroscience knowledge into society.

Keywords

Teenage brains; scientific parenting; neuroethics; ethics of emerging technologies; science valorisation

1. Introduction

In the past ten years, a promising explanation to account for adolescent behaviour has fuelled enthusiasm amongst parents, educators, journalists, policymakers, and pedagogical experts: the teenage brain. The teenage brain tells the complicated story of decreasing grey cells, pruning and a plastic brain as *work-in-progress*. Specific brain regions are said to grow into specialized functions, until adolescents reach the age of about 25. The cognitive and the emotional functions of the teenage brain are said to be ‘out of balance’, as especially the prefrontal cortex (PFC) of the adolescent brain is considered to be in a state of ripening or maturation. As a dire consequence, the unbalanced and immature prefrontal cortex leaves our future adults in a perpetual state of impulsiveness, irrationality and riskiness, but also of increased sociality and creativity. The coming of age of the adolescent brain is a technical tale of wonder, opportunities, and risks.

This chapter explores some ethical implications of this neurobiological understanding of adolescence. Recently, (neuro)ethicists have explored the implications of the teenage brain for legal decision making, and whether the immature PFC could result in a diminished responsibility and culpability (e.g. Luciana, 2010; Ryberg, 2014). Other scholars have addressed the appropriation of the teenage brain in society, and critiqued the underlying promise that the teenage brain ‘finally solves the mystery of adolescence’. For example, Choudhury (2010) has shown how the ‘turbulent’ teenage brain is often used as a cause explaining ‘limitless behavior’ and ‘youth gone wild’, thereby reiterating stereotypical images and prejudices about adolescents (Choudhury, 2010). Some question the very

possibility of a neurobiological understanding of adolescence, calling the immature teen brain a myth since it would confuse cause and effect (Epstein, 2007).

Instead of scrutinizing the (im)possibility of a neurobiological understanding of adolescence, or theorizing about possible implications of this knowledge for specific ethical concepts, my aim in this chapter is to explore the normative power of the concept of the teenage brain. I do this by looking at the usages of the teenage brain in a specific context: parenting. In recent years, the teenage brain is eagerly adopted in the traditionally ‘soft’ fields of pedagogy and developmental psychology. Increasingly, pedagogues, parenting experts and family coaches base their parental suggestions on neuroscience knowledge of adolescent brain development. Contrary to sceptical voices who fear that this neurobiological turn in parenting would leave parents empty-handed, the topic of adolescent brain development comes with specific prescriptions, action programs, responsibilities and courses of action. Since the prefrontal cortex of teenagers is still in development, parents are urged to complement or take over its functions, and act as *the external frontal cortex* of their adolescents’ brains (Crone, 2012, p. 182). How is the teenage brain appropriated to tell parents what they should and should not do with their adolescents? What does the use of the teenage brain tell us about contemporary ideals of good parenting? Does the teenage brain change or destabilize existing ideas of good parenting? And what does it really mean to be a good external frontal lobe?

To answer these questions, I follow the journey of the teenage brain in Dutch popular parenting discourse. After introducing the birth of the teenage brain in the Netherlands, by discussing the bestselling popular science works of internationally renowned neuropsychologist Eveline Crone, I show how Crone’s teenage brain is used by all kinds of parenting experts to justify and combine different (and sometimes conflicting) parental norms, mobilizing different epistemic and normative assumptions regarding parents, teenagers, and their plastic brains. I then question what it means to be a good external prefrontal cortex, and show how this notion can be seen as the latest episode in the

rich tradition of science-based parenting advice. Finally, I briefly explore what the case of the teenage brain can tell us for understanding the ethical implications of neuroscience knowledge.

Probing how knowledge of adolescent brain development might affect ideas of good parenting, assumes a pragmatist stance towards ethics. My view on ethics is inspired by recent work done on the ethics of emerging technologies in Science & Technology Studies (STS). Public debates around emerging technoscience – such as the neurosciences – are often characterized by expectations, promises, hopes, fears, and recurring patterns of moral argumentation (cf. Borup et al., 2006; Pickersgill, 2013; Swierstra and Rip, 2007; Swierstra et al., 2009). Simply discarding such promissory discourses as neuromyths, ‘neurotrash’ (Tallis, 2009) or ‘neurobollocks’ (Poole, 2012) ignores that the popularization of neuroscientific knowledge in society is an important part of the flourishing of neuroscience as knowledge system itself, playing a constitutive role in mobilizing support, funding and engagement with the wider audience (Choudhury & Slaby, 2012; Heinemann, 2012). A pragmatic, co-evolutionary view on the relationship between (neuro)science and morality allows me to explore what role norms, values, and ideas of the good play in the appropriation of neuroscience knowledge in society. And, more importantly, how the neurosciences are able to address, influence and possibly destabilize our norms, values and ideas of what it means to be a good parent.

2. Teen brain plasticity and the maturing prefrontal cortex thesis

Research on the brains of adolescents is fairly new. Actual research on human brains in puberty and adolescence started only in the 70s and 80s. These studies were rare though, because post-mortem brains of adolescents were difficult to obtain (Choudhury, 2010). Things changed with the rise of brain scanning techniques. In 1999, Jay N. Giedd, a child and adolescent psychiatrist at the National Institute of Mental Health (UK), published the first longitudinal brain imaging study on the brains of adolescents in *Nature Neuroscience*. Giedd et al. (1999) showed that there are different peak levels of

gray matter in different brain regions during different developmental stages of the adolescent brain. This indicates that besides the first three years after birth, a then well-known critical phase of brain development, a second critical development stage could be distinguished. This would mean that adolescents' brains are not finished or fixed yet, but *plastic* and still developing. The much-quoted article of Giedd et al. became a landmark in studies of the adolescent brain.

In the Netherlands, knowledge about adolescent brain development has been brought to the general public mainly through the works of Eveline Crone, professor of neurocognitive developmental psychology at Leiden University (the Netherlands). In *Het Puberende Brein* (2008) and *Het Sociale Brein van de Puber* (2012), both popular science best-sellers, Crone describes the process of brain development of adolescents by focusing on cognition, emotion, sociality and creativity. Based on existing animal and lab studies, patient studies of brain injuries, and her own functional magnetic resonance imaging (fMRI) studies on adolescents in her Brain & Development Lab in Leiden, Crone explains how the onset of puberty comes with increased release of gonadotropin-releasing hormone (GnRH), and how this hormone interacts with the organization of brain functions. During the brain development of adolescents specific brain regions grow into specialized functions, by a process of 'pruning': a subsequent decrease (after a sudden increase) of grey cells. The speed of this process of pruning differs for specific brain structures, which would determine when teenagers acquire specific skills during the different stages of adolescence (Crone, 2008, p. 4). The fast ripening of some areas combined with a slower ripening of others is said to explain many of the typical teenage behaviors. Because of a slow ripening of the lateral frontal cortex, teenagers are said to have problems with memorizing, processing information, the inhibition of behavior, and planning. In contrast with the still slowly increasing cognitive power, the emotional functions of the teenage brain are said to be hyperactive. According to Crone, teenagers are especially sensitive for the possibility of rewards: adolescents are often driven by "the pleasure area in the brain", the nucleus accumbens (Crone, 2008, p. 113). The relationship between the "cognitive brain" and the "emotional brain" is seen as one of

competition and strife, resulting in an “imbalance”, which is characteristic for adolescent behavior according to Crone.

The slower ripening of cognitive skills combined with an overactive emotional system, makes for the *maturing prefrontal cortex thesis* (PFC-thesis). The PFC-thesis would not only account for the imbalance between cognitive and emotional brain functions, but also for the increased sociality and creativity during this phase of life. According to Crone, teenagers have difficulties with understanding emotions and recognizing facial expressions of others, and with taking perspectives of others into account. Because of the frontal lobe of adolescents is not yet able to regulate the heightened emotionality, adolescents are said to be more sensitive than adults to social exclusion Crone, 2012, p. 91). Similarly, the presence of peers would give the teenager the pleasant feeling of a reward, which would explain the increased risk-taking behavior of teenagers when peers are present. Finally, Crone explains how the PFC-thesis makes teenagers many times more creative, idealistic and inventive than adults. During adolescence, brain areas which are deemed important for creativity, resourcefulness, musicality, sports and social involvement, are the last to be subjected to the process of pruning of connections (Crone, 2008; p. 150). The lack of performance of the prefrontal cortex becomes beneficial, as it might be a hindrance for forming creative ideas, or for behaviors such as sincerity, political engagement and idealism which Crone considers typical for the adolescent brain.

The PFC-thesis quickly found its way in public discourse. After the publication of her books, Crone is quickly seen as the Dutch expert on adolescent brain development and frequently featured in national newspapers, TV-shows, reports and magazines, and discourse on teenage brains quickly broadened to a wide range of topics. The teenage brain became a popular *explanans* to account for topical issues such as street violence, the radicalization of young Muslims travelling to Syria, cases of youths rioting, and other excesses such as youth suicides due to pestering. After widespread dissemination in all kinds of media, the notion of the teenage brain became a kind of commonplace when addressing adolescents, and part of the symbolical toolkit to explain adolescent behavior and

parenting issues.¹ Despite Crone's explicit statement that her books on teenage brains are not parenting manuals, pedagogues, family coaches, (self-declared) parenting experts, and parents eagerly adopted the teenage brain to discuss parenting issues.

To explore the dissemination and reception of the teenage brain in public discourse, I follow the journey of Crone's work. I conducted a search of the LexisNexis news database for Dutch media coverage of the teenage brain, between the period of 2000 and 2013. Approximately 220 articles addressed parents in some way. These include best-selling newspapers with a political signature from right to left. In addition, sources also include disciplinary pedagogical magazines, popular parenting magazines, online blogs and forums of parenting websites, parenting books which feature the teenage brain, and presentations for parents by local governmental portals for parental information. This body of empirical material spans both the dissemination of the teenage brain in a variety of media in Dutch popular culture, as well as the appropriation by different actors involved in parenting (i.e. parents, family coaches, policy-makers, and pedagogues).

3. Acting as an external frontal lobe: two moral repertoires of parenting teenage brains

Two different normative discourses surrounding the idea of parenting-as-external-frontal-lobe can be distinguished. I dub these discourses *moral repertoires*, based on the notion of interpretative repertoire (Wetherell & Potter, 1988; Wetherell, 1998), as they consist of a range of symbolic codes (in this case parenting norms, values and ideas about adolescents) that are often performed or put forward without being questioned or made explicit. Each of these moral repertoires consists of two parts. The first part contains normative ideas about parenting – action programs based on knowledge of the teenage brain and ideals of good parenting. The second part of a moral repertoire consists of a developmental

¹ The teenage brain also found a willing audience in educators and educational policy-makers. In popular media, the lack in cognitive development of the teenage brain is often used to explain problems such as low test scores, a lack of motivation for reading books or registering for Greek and Latin at high schools, or to argue for or against specific educational policies, ways of teaching and curricula change.

perspective about the natural development of the teenage brain and what it needs, including an evaluation of character traits and behavior which are deemed good, bad, beneficial or harmful for this development. Through these repertoires, different epistemic assumptions regarding parents, teenagers, and their plastic brains are mobilized. Both repertoires propose that parents should act as an external frontal lobe for their adolescents, but *how* to be a good frontal lobe and for what goal or value, differs. The teenage brain gains traction precisely because it can be appropriated for these different ideas of good parenting, and combine them, while reconfiguring them in terms of the brain at the same time. In the first repertoire, parents are cast as a kind of guardians of external stimuli, whereas in the second repertoire, parents are seen as stimulating coaches. It appears that the teenage brain in both repertoires is made valuable as biological justification for more parental control and setting rules, albeit discussion remains about acceptable degrees of parental control, how parents should exert it, and what parents can and should expect from their teenagers.

Moral repertoire 1: parents as protective guardians of external stimuli

To the path of a matured brain and a responsible citizen, lots of risks loom around the corner. In this first repertoire, the teenage brain is often used as an *explanans* for indicating why certain prevalent – often seen as increasing – types of adolescent behavior are harmful for teenagers and their brains. The heightened emotionality and impulsiveness of the teenage brain are used in this repertoire to account and warn for irresponsible risk-taking behavior, as we read in this parenting magazine (Eerkens, 2007):

“A teenager is inclined to take decisions that result in a short-term reward. Because of this, he quickly decides to do irresponsible things: eating too much, too fat or too sweet, practicing dangerous sports, like the newest fad to jump off of buildings or from roof to roof. As long as it gives an immediate kick. Teenagers do not see risks at that moment.”

Parenting as external frontal lobe is concerned here with the protection from risks. The disrupting of the ‘natural’ development of the growth of the developing brain of teenagers is seen as the greatest danger, and is used to urge parents to be more directive and protective. This repertoire is especially present in popular mass media, when publicly reported topical excesses such as street violence or binge drinking result in cries by commentators and experts for parents to take more responsibility and “finally start parenting again”. Dangerous external stimuli for a developing teenage brain are those that physically hamper its (natural) development. The most discussed danger for adolescent brains is addictive behavior: alcohol usage, smoking and other drugs (cannabis, speed, the party drug gamma-Hydroxybutyric acid), but also gambling, excessive eating and ‘new’ addictive risks such as gaming and social media use. Alcohol and drugs remain the most dangerous risks for a developing teenage brain, and as such are strongly condemned. Another perceived and topical danger for the teenage brain are digital technologies. Parents seem to struggle with smartphones and internet-use in their households. Problems such as cyber bullying, extensive gaming, internet porn addiction and heavy smartphone-use are frequently featured topics in parental magazines and parenting books. Because of the PFC-thesis, teenagers are said to be prone to obsessive and ‘monomaniac’ behavior (impulsivity combined with focus on short-term rewards), therefore parents are urged in this repertoire to set clear rules for computer, internet and phone-use, to prevent addictive and obsessive behavior. Just as in the case of alcohol, knowledge about the teenage brain is used here as an unquestionable biological justification and necessity for parents to protect its development, by setting and upholding clear limits.

To protect the natural development of their adolescents’ brains, parents should set and uphold rules by using strategies of disciplining. Two main strategies are proposed in this repertoire: prohibition, and external motivating through giving rewards or punishment. In the case of alcohol for example, postponing its use should be achieved by strictly prohibit without discussion, as alcohol and drugs are seen as too dangerous for the teenage brain to leave it as a matter of negotiation. Less dangerous risks such as internet and smart phone-use should be limited by setting rules through

agreements with teenagers, consistently uphold these, and rewarding of good behavior. Stressing the emotional sensibility of teenagers, giving direct rewards would be preferable over punishment as “young brains learn the most from rewards” (Korteweg, 2010). When upholding certain rules or limits, parents should “dare to seek confrontations, not avoid difficult conversations, and demand obedience” (Jansen Schoonhoven, 2013). Or, as these self-declared teenage-experts ironically phrase it: “Treat them like dogs: reward good behavior. [...] Just like you’ll catch flies with syrup, you’ll catch teenage attention and good will with compliments.” (Van der Wal & Dijkgraaf, 2013).

Parents in this repertoire should lower their expectations as adolescents are not able to fully use their frontal cortex, as this pedagogue argues (Horsthuis, 2008):

“For a long time, our expectations of teenagers were too high. We wanted to take them seriously, because they look so mature and because they themselves want to be taken seriously. But the fact is that you cannot expect them to be all that reasonable.”

As a consequence, parents should be more proactive and “help teenagers with everything their brains have difficulties with” (Pardoen, 2008). The maturing PFC-thesis is used here to frame teenagers as a kind of *defective* adults: their brains are ‘work in progress’, not there yet, and their brains are just *wrong* compared to the right brains of adults. Their plastic brains are interpreted as *vulnerability*, by which the focus shifts to risks that might harm or disrupt the natural development of the teenage brain. The developmental perspective of natural brain development of adolescents is interpreted here as needing a particular kind of guidance, correction or protection. As a result, parents as substitute brains become a kind of *guardian* against harmful stimuli from the outside world, and responsible for a natural and optimal development of their adolescents’ brains.

Moral repertoire 2: parents as stimulating coaches

In the second moral repertoire, the central question is: How to get the best out of your teenager? Being an external frontal lobe in this repertoire means that parents should give their teenagers some freedom to experiment, as the teenager is “enterprising, is open for many stimuli, focused on challenges, and thus needs to gain experiences” (Jolles, 2011). The teenage brain is used here to talk about the role of parents in the process of adolescent self-actualization. The underlying developmental perspective is that of a developing adolescent brain that seeks new experiences and new input to mature. To reach the goal of a mature brain in adulthood, a natural development of adolescent brains includes exploring, experimenting and acquiring different experiences.

For example, regarding social exploration and experimenting with social identities, it is often suggested in parental magazines that parents should give their adolescents some slack, and offer them the opportunity to acquire new experiences for themselves (Leef! Magazine, 2008):

“Give a teenager the chance to do things which you as an adult don’t like (anymore), such as watching horror movies, big physical challenges, or other exciting stuff. A teenage brain not only fancies excitement, but by doing so it has an opportunity to learn to deal with problems and feelings of fear.”

Similarly, parents should not protect or prevent their adolescent from acquiring negative or disappointing experiences. Regarding cognitive tasks, such as homework or planning, parents should help and support where possible – but not take over. Teenagers themselves must learn to plan their homework, helping them doing their homework is out of the question.

The plasticity of teenage brains is interpreted here as an *opportunity*; a unique phase in life in which the brains is able to grow and develop the most. Consequently, the teenager with his/her plastic brain is framed as a unique individual (Van Hintum, 2012): “Teenage brains are not like unfinished adult brains; they are creative innovation and learning machines, with their emotional circuits focused on new experiences and exploring social contacts”. Parents in this repertoire still need to set rules and

limits, but not for reasons of protection. Rather, such rules and limits are seen as necessary for the process of self-actualization. The idea is that teenagers need to have some limits or rules which they can rebel against. So when setting rules and upholding them, parents should refrain from punishments or rewards, but focus rather on intrinsic motivation, negotiation, mutual agreements, and making decisions together. Even regarding alcohol, which led experts in the first repertoire to stress the need for strict prohibition, experts in this repertoire cling on to the need to let adolescents themselves make the right choices, as we read in this workshop about Crone's teenage brain at a high school in Amsterdam (Dugomay & Mok, 2009):

“Reward or punishment for good or bad behavior doesn't work anymore. Important is rather to think along with the teenager, discuss different options together, clarify consequences and discuss what the (logical) effects could be of their actions – for example regarding traffic, alcohol and drug use. Try to stimulate development by letting them make choices from different options. That's how a teenager learns to make a rational judgment, and it brings ratio and emotion faster in balance. They still have to learn the chain of cause and effect. Dedicated, non-patronizing support of parents can help them with this.”

Similarly, in contrast with the first repertoire, parents should not draw the conclusion that teenagers are just not ready for adult behavior, because their brains aren't finished. Instead of low expectations, parents in this repertoire are encouraged to actually raise their expectations as this developmental psychologist argues (Pont, 2010):

“The right conclusion should be: precisely because the brains of teenagers are not mature yet, we have to stimulate and challenge them. Adult requirements make you mature, even if you're not. Just like you're not waiting to teach your child how to talk, until the moment that he actually can already.”

Instead of focusing on behaviors such as irrationality or riskiness, the focus in this repertoire shifts towards more positively evaluated behaviors as characteristic for the teenage brain: behaviors that stress opportunities to excel. The maturing prefrontal-cortex thesis is interpreted here with an emphasis on the increased sociality, emotionality and creativity of the teenage brain. Teenage behaviors that are deemed as unequivocally beneficial for their developing brains are especially behaviors that stress creativity and out-of-the-box thinking, sociality, (political) idealism and sincerity. These character traits, framed as typical of a teenage brain, are seen as opportunities for adolescents as unique individuals that should be cherished and encouraged by parents. Parents in this repertoire thus become a kind of stimulating coaches, only curbing the freedom of their adolescents in order for them to flourish and excel.

Acting as external PFC for the teenage brain	Moral repertoire 1: parents as guardians of external stimuli	Moral repertoire 2: parents as stimulating coaches
<i>Action program: parental norms</i>	Prohibition, punishment, praise (disciplining)	Stimulation, support, steering (motivating)
<i>Parenting goal</i>	Natural / normal / undisturbed brain development	Teenage (brain) self-actualization
<i>Teenager as</i>	Defective adult	Unique individual
<i>Diagnosis (interpretation of PFC-thesis)</i>	Focus on riskiness, emotionality (negatively evaluated character traits)	Focus on creativity, sociality, idealism (positively evaluated character traits)
<i>Plasticity as</i>	Vulnerability	Opportunity

Fig. 1. Normative and epistemic assumptions of parenting as 'external frontal lobe'.

The two moral repertoires make visible how the teenage brain can be mobilized by experts to propose different and sometimes conflicting parental norms. The teenage brain appears to be versatile enough to reconcile different epistemic and normative assumptions regarding teenagers and parenting. The distinction between the two moral repertoires is analytical; in practice, experts in parental books or in parenting magazines easily switch between the two moral repertoires and suggest parents both to be more strict and to let go at the same time. The message is thus that acting as external frontal lobe entails balancing between protecting teenage brains from dangerous stimuli and stimulating teenage brains to flourish. How to explain the emergence of these different repertoires of parenting norms? What can they tell us about contemporary parenting ideals? And does parenting as external frontal lobe actually change ideals of good parenting?

4. Parenting turmoil: the teenage brain and ideals of good parenting

Neuroscience research of adolescent brain development can be seen as the latest 'evidence' in a tradition of science-based parenting advice. As the historians Depaepe (2003), Wubs (2004) and Wesseling (2002) show, science-based advice from parenting experts over the past century – consisting of advice regarding parenting goals / ideals and ways of parenting – reflect not only societal developments, such as industrialization, modernization and individualization, but are also closely tied to changes of theories, methods, and practices of the scholarly discipline of (developmental) psychology.

The psychologist Stanley Hall is famous for his first explanation of adolescence as a biological phase in life. Less well known are his 'pedagogical imperatives', which stressed disciplinary and

instructional techniques, and was set against raising by tradition or neglect (Lesko, 2002, p. 88). After the period of so-called normative pedagogy, in which different religious and ideological views (the Dutch pillarization of society) defined parenting goals (Depaepe, 2003; Wubs, 2004), the behaviourist approach towards parenting was succeeded by a psychoanalytic perspective, with the famous Dr. Spock as the most well-known proponent (cf. Spock, 1946). Prior to the 70s, Dutch parenting advice mainly centered around character development and the societal responsibility of parents to make sure their children became responsible and virtuous citizens (Wubs, 2003, p. 210). From the 1970s onwards, parenting goals became increasingly formulated in terms of developmental psychology. Self-development and (emotional) well-being of the child were no longer seen as a condition for a healthy development towards a normative goal (such as a virtuous or disciplined citizen), but became parenting goals on itself (Wubs, 2004, p. 216). Parenting experts focused on practical methods and techniques of parenting instead of explicating parenting ideals. An example is the notion of parenting styles (cf. Baumrind, 1971), which became popular in the social sciences by the 1980s and 1990s. During the 1980s and 1990s, developmental psychology remained a strong source of authority for parenting experts, though a new form of evidence emerged as well: genetics. An example is Judith Harris' *The Nurture Assumption* (1991), in which she argued that genetic factors and peers are far more influential for the development of the child than parents; the role of parents and of parenting should be seen as minimal (Harris, 1991). The teenage brain can be seen as the latest evidence in this 'biological turn' of parenting advice, but with quite different normative inferences.

Experts in the two moral repertoires rarely explicate parenting ideals, but they do frequently use the teenage brain to differentiate between good and bad forms of parenting, which they describe in Baumrind's notion of parenting styles. Parents who adopt a more laissez-faire kind of attitude and embrace liberal and more lenient parenting styles are strongly rejected or condemned. In the first repertoire, 'bad' parents are those who stress a mutual agreement between parent and adolescent (described as liberal and democratic parenting styles), instead of exerting a certain amount of control

through disciplining or prohibition. In the second repertoire, bad parents are those who have too low expectations of their adolescents and thus don't take the needs of the adolescent (brain) seriously enough (described as neglectful or permissive parenting styles). Contrary to the explicit rejection of 'bad' ways of parenting, views on what actually is good parenting mostly remain implicit.

If we look at the emerging image of parents as external frontal lobe, we can see a striking resemblance with the so-called *authoritative parenting style* (Baumrind 1971, 1991; Macoby and Martin, 1983). The authoritative parenting style can be described as 'a balancing act' or a golden mean between self-actualization (of the adolescent), and the protection of dangers. This balancing act is seen by many contemporary Dutch pedagogues and sociologists, as well as parents, as typical for the contemporary Dutch ideal of parenting (Brinkgreve, 2012; De Winter, 2005; J/M Ouders, 2010). It is a parenting style in which parents actively set boundaries and explain with the goal of promoting adolescent's responsibility (De Winter, 2005, p. 11). Parents who are urged to act as external frontal lobes are expected to combine setting clear limits (strong control) while acknowledging and nurturing the needs of the adolescent (in this case: the needs of his or her brain). The teenage brain seems to function as credible support to this difficult balancing act. However, the emergence of two moral repertoires – with different action programs and ideas of how and why to set limits – shows that the teenage brain does not give an inconclusive answer, but rather is interpreted through this very ideal of authoritative parenting itself.

When we compare parenting as external frontal lobe with earlier debates on parenting, a continuity can be observed. Just as parenting goals in the 1970s became formulated in terms of developmental psychology, current parenting goals are formulated in terms of the developing teenage brain. The idea of parenting as external frontal lobe, including the very concept of parenting style itself, is a *procedural* notion: it doesn't include a substantial, normative ideal of good parenting. As the two moral repertoires show, the teenage brain is appropriated to tell parents *how* they should intervene, or *when*. The *why* is formulated in terms of protecting or stimulating teenage brains. *What*

parents actually should learn their adolescents to become, is not described in normative ideals (such as character building or responsible citizenship). Rather, the implicit end-goal for many experts and parents using the teenage brain, is a ‘normal’ or natural brain development as a prerequisite for adulthood. The teenage brain is heralded by parents as justification for the idea that teenagers ‘really’ are different: their children are not ‘abnormal’. The maturing prefrontal cortex thesis is used in both moral repertoires to frame adolescents as a distinct category of people with shared biological characteristics, assuming that there is a single brain type that would be common for all members of this category (O’Connor et al., 2012). What is deemed a normal or healthy brain development is not questioned. Teenagers in any case seem to be all that adults should not want to be: teenagers are impulsive, irrational, irresponsible, and impulsive (implying that adults are the opposite: controlled, rational, responsible, balanced). In effect, adolescents become symbolically distanced from adults, and the implication is that they also should not be treated as adults – thus increasing the need for parents to exert themselves more. By rooting teenage behaviour in the brain, the differences between adults and adolescents become normalized and as a consequence, the focus turns to their parents; it’s they who have to be raised by learning how to take the brain development of their adolescents into account.

Next to this historical continuity, there is also a clear discontinuity to be observed between earlier parenting debates. Some skeptics infer from the teenage brain a diminishing role for parents – resonating the debate around *The Nurture Assumption* by Judith Harris (1991). These critics assume a deterministic role of the teenage brain as neurobiological explanation, leading parents to think they can’t do anything about it (Koops, 2013). However, as we have seen, the teenage brain is foremost a *plastic* brain. The teenage brain as model of growth and development is often described in terms such as ‘work in progress’, ‘immature’, ‘unfinished’, ‘undeveloped’, ‘malleable’, ‘in transition’, ‘in motion’, ‘flexible’, ‘dynamic’, ‘unbalanced’, ‘imperfect’, ‘sensitive’ and ‘vulnerable’. Though not all references to teenage brains explicitly use the term plasticity, these descriptions of teenage brains equal the developmental dimension of brain plasticity, the forming of the structure and functions of the brain

in a particular sensitive period of growth. Where Hall (1904) spoke of adolescents as ‘becoming’, the phrase now has its neuroscience equivalent in plasticity.

The notion of brain plasticity ‘opens’ up the brain for interventions (Abi-Rached and Rose, 2013). As we have seen, plasticity of the teenage brain is interpreted differently in the two moral repertoires. In the first repertoire, the plastic teenage brain is seen as particularly vulnerable, especially for behaviors that undermine the natural development towards a balanced rationality: addictions (alcohol) but also emotional behavior, or any other behavior that makes teenagers ‘out of control’. In the second repertoire, the plastic teenage brain is presented as having a ‘unique’ flexibility or creativity which allows them to learn and grow. The concept of the plastic, teenage brain enables and invites parents, experts and others to do something with it: in this case, protect its vulnerability or stimulate its unique flexibility. In contrast to the fierce debates in the 1990s around Harris’ *The Nurture Assumption*, the story of the teenage brain shows that it is now safe to acknowledge biological characteristics of behavior without leaving parents empty-handed. The biological imperative of the teenage brain is to view adolescent behavior as a result of their brain development, a natural process which requires specific parental action programs and responsibilities.

5. Conclusion: popular neuroscience as ethics through different means

In this article, I have explored how the teenage brain is made valuable by parenting experts to address parenting issues. I have shown how the teenage brain is used as answer to the timely question of how much control or freedom parents should exert or give their adolescents. Parents are urged to act as the external frontal lobe of their adolescents. Two distinct moral repertoires emerged around this idea of parenting as external prefrontal lobe, each with different normative suggestions regarding expectations parents should have, the degree of control that should be exerted, and the way of exerting control. Different versions of the plastic teenage brain were mobilized in each moral repertoire to justify its

action programs. Together, these two moral repertoires urge parents to both control and let go. As this ‘balancing act’ between different parenting values can be seen as typical for contemporary ideals of good parenting, I argue that the teenage brain in Dutch parenting discourse does not so much change existing ideas of good parenting, but that it is rather appropriated through the lens of this ideal of authoritative parenting. Just as parenting goals in the 1970s were formulated in terms of developmental psychology, contemporary parenting goals become described in terms of the teenage brain. As the latest evidence in the history of science-based parenting advice, the teenage brain does differ from parenting evidence in the 1990s: instead of diminishing the role of parents in favour for determinist biological explanations of development, the plastic teenage brain comes with specific prescriptions and action programs.

The popularity of the teenage brain is a particularly successful example of the ‘valorization’ or dissemination of neuroscience knowledge into society. The widespread appropriation of the brain in public discourse has become a topic of extended scrutiny in recent years. Recent studies on the public representation of neuroscience knowledge in the UK, the US, Germany and the Netherlands, have shown that many neuroscientific ideas in public discourse perpetuate rather than challenge existing policy measures, the status quo or modes of understanding of self, others and society (cf Choudhury and Slaby 2012; O’Connor et al. 2012; O’Connor and Joffe, 2013). Similarly, the case of the teenage brain indicates that we should not so easily assume a transformative potential of the neurosciences to change our conceptions of ourselves, our values, or our responsibilities towards others. At the same time, probing the actual usages of neuroscience knowledge in society remains a fruitful venue for exploring possible ethical implications of the rise of neuroscience in society. A neuroscience understanding of behavior doesn’t speak for itself: technical brain facts are *made valuable* when they are used, and as such receive the potential to influence or destabilize our norms, values, and ideas of the good. As this chapter has shown, the teenage brain is not only valued for its promise to finally solve ‘the mystery of adolescence’, it also gets imbued with the normative power to address what it

means to be a good parent. To dismiss popular usages of the neurosciences as ‘hype’ or just ‘bad’ or over-inflated interpretations of science, would mean missing out on such different ways neuroscience knowledge is made valuable in society.

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(Willem Koops in NRC Handelsblad, April 13 2013)